

# **EXHIBIT 2**

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Dated: October 9, 2007

Signature:

(Andrew T. Zide)

**EXPEDITED PROCEDURE**

Group Art Unit: 2116

Docket No.: SCEI 3.0-200

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**In re Patent Application of:**

**Keisuke Inoue**

**Application No.: 10/812,155**

**: Group Art Unit: 2116**

**Filed: March 29, 2004**

**: Examiner: S. Stoynov**

**For: METHODS AND APPARATUS FOR  
ACHIEVING THERMAL MANAGEMENT  
USING PROCESSOR MANIPULATION**

**AMENDMENT PURSUANT TO 37 C.F.R. § 1.116**

**MS AF  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450**

**Dear Sir:**

**In response to the Office Action dated June 13, 2007,  
finally rejecting claims 15-19 and 37-51, please amend the  
above-identified U.S. patent application as follows:**

IN THE CLAIMS

1-14. (cancelled)

15. (currently amended) A processing system for processing operations associated with thermal attributes, comprising:

a first operation having a first thermal attribute exceeding an operating threshold;

a second operation having a second thermal attribute not exceeding the operating threshold;

the first and second thermal attributes (TA)  
being determined according to the equation:

$$\text{TA} = k * (P/S)$$

in which P is power density of a component, S is the footprint of the component, and k is a thermal estimation constant; and

a processor for executing the first and second operations, the processor having a thermal threshold;

wherein, if the thermal threshold of the processor is not exceeded, the processor selects the first operation for processing, and

if the thermal threshold of the processor is exceeded, the processor selects the second operation for processing.

16. (original) The system of claim 15, wherein, if the thermal threshold is not exceeded, and if the first operation is not available, then the processor is operable to obtain and execute the second operation.

17. (original) The system of claim 16, wherein, if the second operation is not available, then the processor is operable to idle for a predetermined period of time.

18. (original) The system of claim 15, further comprising:

a plurality of priority queues, each of the priority queues including a first queue and a second queue, the first queues for storing the first operation and the second queues for storing the second operation.

19. (original) The system of claim 18, wherein a first one of the priority queues is a high priority queue, a second one of the priority queues is a medium priority queue, and a third one of the priority queues is a low priority queue.

20-36. (cancelled)

37. (currently amended) A processing apparatus for processing operations, comprising:

a first operation having a first thermal attribute not meeting a condition;

a second operation having a second thermal attribute meeting the condition,

the first and second thermal attributes (TA)  
being determined according to the equation:

$$\text{TA} = k * (P/S)$$

in which P is power density of a component, S is the footprint of the component, and k is a thermal estimation constant; and

a processor for executing the first and second operations, the processor comprising a processing element, a processing unit or a sub-processing unit and having a thermal threshold;

wherein, if the thermal threshold of the processor is not exceeded, the processor selects the first operation for processing, and

if the thermal threshold of the processor is exceeded, the processor selects the second operation for processing.

38. (original) The processing apparatus of claim 37, wherein, if the thermal threshold is not exceeded, and if the first operation is not available, then the processor is operable to obtain and execute the second operation.

39. (original) The processing apparatus of claim 38, wherein, if the second operation is not available, then the processor is operable to idle for a predetermined period of time.

40. (original) The processing apparatus of claim 37, further comprising a plurality of priority queues, each of the priority queues including a first queue and a second queue, the first queues for storing the first operation and the second queues for storing the second operation.

41. (original) The processing apparatus of claim 40, wherein a first one of the priority queues is a high priority queue, a second one of the priority queues is a medium priority queue, and a third one of the priority queues is a low priority queue.

42. (original) The processing apparatus of claim 37, wherein the processor comprises the sub-processing unit, and the sub-processing unit includes a floating point unit, an integer unit and a register associated with the floating point unit and the integer unit.

43. (original) The processing apparatus of claim 42, wherein the sub-processing unit further includes a local store.

44. (currently amended) The system of claim 15, wherein the ~~first and second thermal attributes are based on a power density of the component is based on a power density of the processor.~~

45. (previously presented) The system of claim 44, wherein the processor includes a plurality of subcomponents, and the power density is based on a physically related group of the subcomponents.

46. (previously presented) The system of claim 44, wherein the processor includes a plurality of subcomponents, and the power density is based on a logically related group of the subcomponents.

47. (currently amended) The system of claim 15, wherein the first and second thermal attributes are further based on an amount of heat generated over a period of time by the processor.

48. (currently amended) The processing apparatus of claim 37, wherein the ~~first and second thermal attributes are based on a power density of the component is based on a power density of the processor.~~

49. (currently amended) The processing apparatus of claim 37, wherein the first and second thermal attributes are further based on an amount of heat generated over a period of time by the processor.

50. (currently amended) The processing apparatus of claim 42, wherein the power density of the component is first and second thermal attributes are based on a power density of the

~~processor, and the power density is based on a physically related group of one or more of the floating point unit, the integer unit and the register of the processor.~~

51. (currently amended) The processing apparatus of claim 42, wherein the power density of the component first and second thermal attributes are based on a power density of the processor, and the power density is based on a logically related group of one or more of the floating point unit, the integer unit and the register of the processor.

52. (new) The system of claim 15, further comprising a compiler configured to manage component temperature, wherein:

the first and second thermal attributes each have one or more points associated therewith;

the component has a thermal index associated therewith, the thermal index identifying a number of thermal attribute points that the component dissipates as heat per clock cycle; and

the compiler is operable to predetermine whether the component will overheat when executing at least one of the first and second operations based on the number of thermal attribute points dissipatable per clock cycle in comparison to the thermal attribute points of the at least one first and second operations.

53. (new) The processing apparatus of claim 37, further comprising a compiler configured to manage component temperature, wherein:

the first and second thermal attributes each have one or more points associated therewith;

the component has a thermal index associated therewith, the thermal index identifying a number of thermal attribute points that the component dissipates as heat per clock cycle; and

the compiler is operable to predetermine whether the component will overheat when executing at least one of the first and second operations based on the number of thermal attribute points dissipatable per clock cycle in comparison to the thermal attribute points of the at least one first and second operations.

REMARKS/ARGUMENTS

The present amendment is responsive to the final Office Action dated June 13, 2007. Claims 15, 37, 44 and 47-51 have been amended. New claims 52 and 53 have been added. No new matter has been introduced by the amendments or new claims. A request for continued examination is submitted herewith along with a Petition for a one-month extension of time.

Reexamination and reconsideration of the above identified application, pursuant to and consistent with 37 C.F.R. § 1.116, and in light of the amendments and remarks that follow, are respectfully requested. Because the present claims are believed to be in condition for allowance over the cited art, good cause exists for the entry of this amendment in accordance with 37 C.F.R. § 1.116.

Claims 15-17, 37-39 and 42-43 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,775,787 ("Greene"). Applicant respectfully traverses the rejection.

Claims 15 and 37 are the two independent claims pending in this case. These claims focus on computing operations that have thermal attributes and a processor which has a thermal threshold. Different operations may be selected in view of their thermal attributes so that the thermal threshold of the processor is not exceeded.

In contrast, as explained in the prior amendment filed on March 23, 2007, Greene is directed to "instruction scheduling for electronic devices based on power estimation." (Col.1, 11.7-8, emphasis added.) Power estimates are made to avoid power spikes and other problems. In order to determine power consumption, "power values" may be applied to instructions per Greene. As stressed in the amendment, the use of "power values"

associated with instructions is not what is claimed. Rather, the claims of the instant application pertain to thermal attributes of operations and thermal thresholds of processors. A full discussion of Greene may be found in the prior amendment, which for conciseness is hereby incorporated by reference.

The Office Action states that it "is well known in the art that there is a direct correlation between power consumption, power dissipation (measured by various methods including counting the number of executed instructions - i.e. different power dissipation by different operations consisting of different types or number of instructions), and heat or temperature dissipation, as evidenced by Gschwind et al, US Patent No. 6,948,082." (Office Action, p.9.)

While there may be some correlation between heat/temperature and power consumption, applicant respectfully submits that this is simply not a basis for the anticipation rejection of independent claims 15 and 37 as set forth in the Office Action, as the Office Action fails to clearly demonstrate the exact correlation between power consumption, power dissipation and heat/temperature dissipation in view of the limitations present in the claims.

With regard to Gschwind, applicant notes that this patent refers to both temperature and power dissipation as thermal properties. As stated in this reference, "[i]f the obtained measurement of a thermal property (temperature or power dissipation) is below the activation threshold value for triggering the thermal control circuit, control transfers to step 230. Otherwise, control is transferred to step 240." (Col. 3, 11.50-55.) Nonetheless, as best understood, Gschwind does not appear to equate temperature with power or to provide an express, direct, or consistent correlation between the two.

In view of the above, applicant submits that claims 15 and 37 as originally set forth distinguish over Greene and the other art of record.

Nonetheless, in the interests of clarity and to expedite prosecution, the independent claims have been clarified to recite that the thermal attributes are determined according to the equation  $TA = k * (P/S)$ , in which P is power density of a component, S is the footprint of the component, and k is a thermal estimation constant. Support for this may be found, by way of example only, in specification paragraph 0058.

Applicant submits that Greene, Gschwind and the other art of record fail to teach or suggest such a feature as claimed in independent claims 15 and 37. In view of this, applicant respectfully requests that the rejection as to these claims be withdrawn.

Claims 18-19 and 40-41 were rejected as being obvious over Greene in view of U.S. Patent No. 5,828,568 ("Sunakawa"). And claims 44-51 were rejected as being obvious over Greene in view of U.S. Patent No. 6,775,787 ("Gschwind"). Applicant respectfully traverses these rejections.

Claims 16-39 and 38-51 depend from independent claims 15 and 37, respectively, and contain all the limitations thereof. For at least this reason, applicant submits that the subject dependent claims are likewise in condition for allowance.

Furthermore, claims 52 and 53 have been added and which depend from independent claims 15 and 37, respectively, and contain all the limitations thereof. For at least this reason, applicant submits that the subject dependent claims are likewise in condition for allowance.

Finally, applicant would like to note that there are several pending applications for the same assignee which contain similar subject matter to the instant application. The applications are U.S. Patent Application No. 10/812,177 ("the '177 application"), U.S. Patent Application No. 10/959,700 ("the '700 application") and U.S. Patent Application No. 10/801,308 ("the '308 application").

The '177 application received a final Office Action from Examiner Alhija in Group Art Unit 2128 dated September 11, 2007. A reply to the final Office Action has not yet been submitted.

The '700 application received a final Office Action from Examiner Eric Chang in Group Art Unit 2116 dated June 1, 2007. A reply to the final Office Action was filed on August 24, 2007.

The '308 application has yet to receive an Office Action on the merits.

In view of 37 C.F.R. § 1.56, § 2001.06(b) of the Manual of Patent Examining Procedure, and the fact that different Examiners are assigned to the '177 and '700 applications, applicants submit the following Exhibits herewith:

- (1) a copy of the most recent Office Action in the '177 application;
- (2) a copy of the claims as most recently presented in the '177 application via the amendment of June 21, 2007;
- (3) a copy of the most recent Office Action in the '700 application;
- (4) a copy of the claims as presently presented in the most recent amendment filed in the '700 application; and
- (5) a copy of the claims as originally filed in the '308 application.

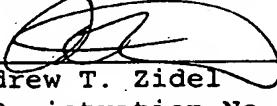
In view of the above, each of the presently pending

claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

If, however, for any reason the Examiner does not believe that such action can be taken at this time, it is respectfully requested that he telephone applicant's attorney at (908) 654-5000 in order to overcome any additional objections which he might have. If there are any additional charges in connection with this requested amendment, the Examiner is authorized to charge Deposit Account No. 12-1095 therefor.

Dated: October 9, 2007

Respectfully submitted,

By   
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